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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,012	12/10/2003	Christopher L. Coleman	10021079-1	7522
57299 7590 03/14/2007 AVAGO TECHNOLOGIES, LTD. P.O. BOX 1920 DENVER, CO 80201-1920			EXAMINER CURS, NATHAN M	
			ART UNIT	PAPER NUMBER
			2613	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		03/14/2007	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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<b>Office Action Summary</b>	Application No. 10/733,012	Applicant(s) COLEMAN, CHRISTOPHER L.	
	Examiner Nathan Curs	Art Unit 2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 December 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6, 8-15, 17 and 18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-15, 17 and 18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 13 and 15 are rejected under 35 U.S.C. 102(a) as being anticipated by Green (US Patent Application Publication No. 2003/0147652).

Regarding claim 13, Green discloses a method for transmitting data in parallel, comprising: emitting light from each light source in an array of light sources in a first module, wherein the light from each light source carries data (fig. 10, element 135 and paragraph 0135) and directing the light from each light source with a first common collimating lens to a second module (fig. 10, element 37 and paragraphs 0035 and 0053) and directing the light from the light sources with a second common collimating lens to corresponding detectors in an array of detectors in the second module (fig. 6 and paragraphs 0040-0041 and 0054).

Regarding claim 15, Green discloses the method of claim 13, further comprising: directing light from the second module with the first common collimating lens to another array of detectors in the first module (fig. 13 and paragraph 0062).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 2, 5, 11 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Green et al. ("Green") (US Patent Application Publication No. 2003/0147652).

Regarding claim 1, Green discloses a free-space parallel optical interconnect, comprising: a first module, comprising: a first die comprising an array of light sources, each light source emitting light (fig. 10, element 135 and paragraph 0135); and a first common collimating lens for directing the light from each light source to a second module (fig. 10, element 37 and paragraphs 0035 and 0053); and the second module, comprising: an array of detectors (fig. 6, element 79 and paragraphs 0040-0041 and 0054); and a second common collimating lens for directing the light from the light sources to corresponding detectors in the array of detectors (fig. 6, element 71 and paragraph 0040). Green doesn't explicitly disclose that the array of detectors is part of a die, however, Green discloses that the array is an array of photodiodes (paragraph 0041). Based on Green's other disclosure for the transmitter array, where the lasers are manufactured on a single semiconductor wafer (paragraph 0052), it would have been obvious to one of ordinary skill in the art at the time of the invention to also use a single semiconductor wafer photodiode array, to provide the benefit of easy of manufacturing for the array.

Regarding claim 2, Green discloses the interconnect of claim 1, wherein the array of light sources is selected from the group consisting of an array of vertical cavity surface-emitting lasers (VCSELs), an array of edge-emitting lasers, and an array of light emitting diodes (LEDs) (paragraph 0052).

Regarding claim 5, Green discloses the interconnect of claim 1, wherein the first module further comprises: another array of detectors; and the first common collimating lens further directs light from the second module to said another array of detectors (fig. 13 and paragraph

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0062). Green does not disclose that the said another array of detectors of the first module is part of a die, however, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a single semiconductor wafer photodiode array, as described above for claim 1.

Regarding claim 11, Green discloses the interconnect of claim 1, and discloses co-located transmitter and receiver arrays using a common collimating lens (fig. 13 and paragraph 0062) and discloses the second module using a second common collimating lens for both receiving and transmitting back to the first module when the first module also provides unmodulated light to use for transmitting back, the second common collimating lens further directs the light from the second module to the first module (fig. 17 and paragraph 0071), but does not disclose a third die comprising another array of light sources, each light source emitting light. However, based on Green's disclosure of co-located transmitter and receiver arrays for the first module, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a similar arrangement of co-located transmitter and receiver arrays for the second module as an engineering design choice in implementing the second module already disclosed by Green as both receiving and transmitting. The type of transmitter claimed merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claim 18, Green discloses the method of claim 13, but does not disclose emitting light from each light source in another array of light sources in the second module and directing the light from said another of light sources with the second common collimating lens to the first module. However, based on Green's disclosure of co-located transmitter and receiver arrays for the first module, it would have been obvious to one of ordinary skill in the art at the

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time of the invention to use a similar arrangement of co-located transmitter and receiver arrays for the second module, as described above for claim 11.

5. Claims 3, 4, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Green (US Patent Application Publication No. 2003/0147652) in view of Kube et al. ("Kube") (US Patent Application Publication No. 2004/0033078).

Regarding claims 3 and 9, Green discloses the interconnect of claim 1, but does not disclose that the light sources and detectors are spaced apart by 50 microns. Kube discloses a free-space array based optical transceiver where the spacing of transmitters and receivers in arrays is within tens of microns (paragraphs 0042 and 0043). It would have been obvious to one of ordinary skill in the art at the time of the invention to space the transmitters and receivers in the arrays of Green within tens of microns, in order to reduce the size of the optical components and allow a larger number of components in the same array space, as suggested by Kube.

Regarding claim 4, Green discloses the interconnect of claim 1, and discloses co-located transmitter and receiver arrays using a common collimating lens (fig. 13 and paragraph 0062), but does not disclose that the first die further comprises another array of detectors and the first common collimating lens further directs light from the second module to said second array of detectors. Kube discloses a free-space array based optical transceiver where the transmitter elements and receiver elements are together on the same plate (paragraphs 0038-0040). It would have been obvious to one of ordinary skill in the art at the time of the invention to form the array of detectors on the same first die as the transmitters in Green, in order to reduce the space needed for the optical components, as suggested by Kube (paragraph 0042).

Regarding claim 10, Green discloses the interconnect of claim 1, and discloses co-located transmitter and receiver arrays using a common collimating lens (fig. 13 and paragraph 0062) and discloses the second module using a second common collimating lens for both receiving and transmitting back to the first module when the first module also provides unmodulated light to use for transmitting back, the second common collimating lens further directs the light from the second module to the first module (fig. 17 and paragraph 0071), but does not disclose that the second die further comprises another array of light sources, each light source emitting light. However, based on Green's disclosure of co-located transmitter and receiver arrays for the first module, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a similar arrangement of co-located transmitter and receiver arrays for the second module as an engineering design choice in implementing the second module already disclosed by Green as both receiving and transmitting. The type of transmitter claimed merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art. Further, Kube discloses a free-space array based optical transceiver where the transmitter elements and receiver elements are together on the same plate (paragraphs 0038-0040). It would have been obvious to one of ordinary skill in the art at the time of the invention to form the array of detectors on the same second die as the transmitters for the second module, in order to reduce the space needed for the optical components, as suggested by Kube (paragraph 0042).

6. Claims 6, 12, 14 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Green (US Patent Application Publication No. 2003/0147652) in view of Green et al. ("Green2") (US Patent Application Publication No. 2002/0141011).

Regarding claim 6, Green discloses the interconnect of claim 1, wherein the first module further comprises: a second die comprising another array of detectors (fig. 13 and paragraph 0062), but does not disclose a third common collimating lens for directing light from the second module to said another array of detectors. However, Green2 discloses co-located optical transmitter and receiver arrays, a corresponding lens for each array (fig. 2 and paragraphs 0025-0032). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a lens for each of the transmitter and receiver arrays as an engineering design choice in implementing the optics for co-located arrays already disclosed by Green. Considering the disclosures of both Green and Green2, the type of optics configuration claimed merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claim 12, Green discloses the interconnect of claim 1, but does not disclose that the second module further comprises: a third die comprising another array of light sources, each light source emitting light and a third common lens for directing the light from the second module to the first module. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a similar arrangement of co-located transmitter and receiver arrays for the second module as an engineering design choice in implementing the second module already disclosed by Green as both receiving and transmitting, as described above for claim 11. Further, based on Green2's disclosure, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a lens for each of the transmitter and receiver arrays as an engineering design choice in implementing the optics for co-located arrays, as described above for claim 6.

Regarding claim 14, Green discloses the method of claim 13, but does not disclose directing light from the second module with a third common collimating lens to detectors in the



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first module. However, based on Green2's disclosure, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a lens for each of the transmitter and receiver arrays as an engineering design choice in implementing the optics for co-located arrays, as described above for claim 6.

Regarding claim 17, Green discloses the method of claim 13, but does not disclose emitting light from each light source in another array of light sources in the second module and directing the light from said another array of light sources with a third common collimating lens to the first module. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a similar arrangement of co-located transmitter and receiver arrays for the second module as an engineering design choice in implementing the second module already disclosed by Green as both receiving and transmitting, as described above for claim 11. Further, based on Green2's disclosure, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a lens for each of the transmitter and receiver arrays as an engineering design choice in implementing the optics for co-located arrays, as described above for claim 6.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Green (US Patent Application Publication No. 2003/0147652) in view of Pavelchek (US Patent Application Publication No. 2002/0071160).

Regarding claim 8, Green discloses the interconnect of claim 1, but does not disclose that the array of detectors comprises an array of positive-intrinsic-negative (PIN) photodiodes. Pavelchek discloses a free-space transceiver using PIN photodiodes for the receiver (paragraph 0054). It would have been obvious to one of ordinary skill in the art at the time of

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the invention to use PIN photodiodes for the photodiodes of Green, because PIN photodiodes are less complicated to implement than other types of photodiodes, as taught by Pavelchek.

### ***Response to Arguments***

8. Applicant's arguments with respect to claims 1-3, 5, 6, 8, 9, 11-15, 17 and 18 have been considered but are moot in view of the new ground(s) of rejection.

9. Applicant's arguments with respect to Kube and claims 4 and 10 have been fully considered but they are not persuasive. The applicant argues against the combination with Kube by stating that Kube only discloses that laser diodes and detectors are on the same "circuit board" instead of being on the same die. This argument is not persuasive because the relevant teaching from Kube is that the emitter and receiver are on the same structure, which results in space-saving. Kube further teaching structure type of "circuit board" is not applicable to the combination because Green already discloses lasers and photodiodes that can be manufactured on semiconductor wafer. MPEP § 2143.01 states "The teaching, suggestion, or motivation must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. 'The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.'" When considering both Green and Kube, the teaching of Kube implicitly suggests putting the laser and photodiodes of Green on the same wafer to save space.

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10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

### ***Conclusion***

11. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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applications is available through Private PAIR only. For more information about the PAIR system, see <http://pairedirect.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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